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WESTERN SPRUCE BUDWORM

PAYETTE AND BOISE NATIONAL FORESTS
1976

STATE AND PRIVATE FORESTRY
Insect and Disease Control
USDA-Forest Service

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Jerry Knopf[1], Arland Valcarce[1], Ron Beveridge[2]

ABSTRACT

The 1976 aerial surveys revealed increasing defoliation on the Payette and Boise National Forests caused by the western spruce budworm. An estimated 900,000 acres of mixed fir forest has been affected. Approximately 510,000 acres of this occurred outside of the Idaho Primitive Area where infestations have been underway since the mid-1960's. Natural control factors such as predators and parasites are not keeping populations under control and a parasite survey showed only 10 percent of the population being held in check by natural control factors. Egg mass surveys were made in infested areas outside of the primitive area. Predictions are for continuing to increasing spruce budworm activity for 1977 on both the Payette and Boise National Forests.

INTRODUCTION

The western spruce budworm, Choristoneura occidentalis (Free.) is indigenous to western forests and therefore always present to some degree in the Douglas-fir, mixed true firs and Engelmann spruce types. Since 1973, budworm populations have increased on both the Payette and Boise National Forests. At that time slightly in excess of 224,000 acres were defoliated by this pest. Aerial sketch mapping in 1976 revealed in excess of 900,000 acres distributed over the two Forests. Normally this pest exists in an endemic status held in check by natural enemies, forest stand conditions and climate. Periodically, however, the budworm is released from its natural controls and causes widespread damage to mature Douglas-fir, true firs and Engelmann spruce. The western spruce budworm is currently epidemic over large portions of the Payette and Boise National Forests. For purposes of this evaluation, these budworm infestations will be treated collectively because of their contiguous nature.

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HISTORICAL INFORMATION

Populations of the western spruce budworm have been recorded as defoliating coniferous stands in the Intermountain Region intermittently since the 1920's. Besides the epidemic in the 1920's a second epidemic was recorded in the 1950's, a third in the early 1960's, and a fourth in the 1970's.

In the northern Rockies budworm infestations generally last one to five years with extensions of six to fifteen years on some occasions. However, southward in the Intermountain Region, infestations have a tendency to persist upwards of ten years.

The first large scale western spruce budworm suppression project in Region 4 took place in 1955 when over 893,000 acres were sprayed with DDT. The following year, 1956, 452,000 acres were treated in a similar manner. Also in 1956 in south central Idaho, 19,000 acres were sprayed with DDT. In 1957, additional acreages were sprayed. In 1963, 250,000 acres were aerially treated in south central Idaho to minimize impacts to the timber resource. A suppression project of 525,000 acres was conducted on the Salmon National Forest in 1964. The following year, 1965, a proposed 300,000 acre project was cancelled when unseasonal freezes severely reduced emerging larval populations. A suppression project of approximately 300,000 acres near Salmon, Idaho in 1965 was cancelled when unseasonal freezes severely reduced emerging larval populations. From that point, budworm populations fluctuated until 1973 when increases began on the Payette and Boise National Forests.

GENERAL INFORMATION

INSECT: Western spruce budworm, Choristoneura occidentalis Freeman.

HOST TREES: Grand fir, Abies grandis (Dougl.) Lindl.
White fir, Abies concolor (Gord. & Glend.) Lindl.
Subalpine fir, Abies lasiocarpa (Hook.) Nutt.
Douglas-fir, Pseudotsuga menziesii var. glauca (Beissn.) Franco.
Engelmann spruce, Picea engelmannii Parry.
Western larch, Larix occidentalis Nutt.

LOCATION: Payette National Forest: Areas west, north, east, and southeast of McCall, Idaho, including the South Fork of the Salmon River drainage on the east, southward to and contiguous with infestations on the northern end of the Boise National Forest westward from the town of Council to New Meadows, Idaho on northward to the Main Salmon River (Figure 1).

Boise National Forest: Areas west of Cascade, Idaho on West Mountain, southward to Sagehen Reservoir and to Payette National Forest lands. Areas east of Cascade toward Big Creek Summit.

FEATURES OF THE AREA: Infestation covers land forms that range from heavily roaded to basically inaccessible. The most significantly visible part of the infestation is on West Mountain, west of Cascade Lake, which is observable from highway 55. Elsewhere, infestations are visible in the McCall area to the north, east and southeast. The most rugged and semi-remote part of the infestation encompasses South Fork of the Salmon River from a point approximately five miles north of Warm Lake and extends downstream to the confluence of the South Fork and the Main Salmon River. The primitive area portion of the infestation is characterized by steep, highly dissected land forms with wide differences in elevation.

BIOLOGICAL INFORMATION

Aerial Sketch Map Survey

Visible defoliation during 1976 was detected and sketch mapped by aerial observers during July, August, and early September (Figure 1). On the Boise National Forest defoliated acreages were categorized as follows: 34,605 light; 23,060 moderate; 32,650 heavy for a total of 90,315 acres. On the Payette National Forest 170,220 light; 111,250 moderate; 140,845 heavy for a total of 422,315 acres in areas not classified primitive. The Idaho Primitive Area was estimated to contain 400,000 acres of defoliation. Oldest and heaviest areas of defoliation on the two Forests were found north and west of McCall, Idaho where top kill and mortality to understory has been occurring for the past three years. This infestation has been underway since 1968. Noticeable top killing has occurred in the West Mountain area, west of Cascade Lake, with reproduction and understory trees showing heavy damage after four years of active budworm feeding. In addition to National Forest lands, budworm populations also exist on state, private, and other federal lands.

Parasite Survey

A survey was conducted to determine parasitism levels. Later instar larvae as well as pupae of western spruce budworm were collected from representative locations on the Payette and Boise National Forests. Parasite emergence data from laboratory rearings are shown in Table 1. Relatively low levels of parasitism were found. An average of 10 percent parasitism was found for infestations on both Forests.

Table 1. Parasitism Rates - Western Spruce Budworm, Payette and Boise National Forests 1976.

Ranger District	No. Insects Reared	No. Emerged Parasites*	Percent Parasitism
Cascade (Boise NF)	492	46	9
McCall (Payette NF)	530	79	15
New Meadows (Payette NF)	466	26	6
Totals	1488	151	Ave. = 10

Egg Mass Survey

Numbers of new egg masses indicate the intensity of defoliation and the area of defoliation can be expected to remain static or increase during 1977. Twenty-nine evaluation plots were established on the Boise and 150 plots on the Payette, in or near known areas of defoliation (Table 2). Egg mass counts were made by collecting two 70 centimeter mid-crown branches from opposite quadrants of three co-dominant Douglas-fir or grand fir trees per plot. Branches were carefully removed with telescopic pruners, labeled, placed in individual cloth sacks and transported to the laboratory in Ogden. New egg masses were then separated from old and counted.

The large size of the 1976 budworm defoliated areas dictated that entomological units be established for overall management considerations. Six units were delineated and will be referred to as Figures 2 through 7. They are: 2. Cascade, 3. Council, 4. Price Valley, 5. West McCall, 6. East McCall, 7. Krassel.

In Figures 2 through 7, aerially observed defoliation was delineated by intensity. Superimposed on these areas are symbols indicating predicted defoliation for 1977. Essentially, these figures represent what happened in 1976 with projections as to the infestation's course in 1977. A brief narrative about each unit follows:

*Twenty one percent were parasitic flies in the family Tachinidae, including Actia sp., Nemorilla sp., Madremyia saundersii (Will.), Aplomya caesar (Ald.), Phryxe pecosensis Tns. and Pseudoperichaeta sp., determined by C. W. Sabrosky; and 79 percent were parasitic Hymenoptera - determinations not returned.

Cascade Unit (Figure 2)

The most recent buildup of budworm populations started on this unit with defoliation becoming visible in 1971. Damage was first noticed northwest of Cascade Reservoir and has increased in a southerly direction to the Tripod Summit Area. From Figure 1 it can be seen that moderate to heavy defoliation is predicted for the northern two-thirds of this unit which received heavy defoliation in 1976. Even though defoliation was classified as light on the southern tip, egg mass surveys indicate heavy defoliation for 1977.

Council Unit (Figure 3)

Defoliation in this unit is contiguous with the Cascade Unit. Mixed fir stands on the Council Unit have a long history of budworm activity. The northern most portions have received damage of varying degrees since 1968. Prior to that, western budworm populations severely damaged stands in the mid-1950's and again in the mid to late 1960's. For the most part, egg mass data predictions for 1977 coincides with defoliation intensities observed in 1976.

Price Valley Unit (Figure 4)

The major portion of this unit exhibited light defoliation in 1976. However, egg mass data indicates heavy defoliation for 1977. As with many areas on the Payette National Forest, this unit has a history of several budworm epidemics.

West McCall Unit (Figure 5)

Since 1968 the western spruce budworm has built up and caused severe annual damage to new buds on this unit. The persistence of this defoliation pattern has caused top killing of true fir throughout the mixed fir type. Approximately two-thirds of this unit experienced heavy defoliation in 1976 with the other third mostly classed as light. Overall, 1977 predictions based on egg mass surveys indicate continuing heavy defoliation for the entire unit.

East McCall Unit (Figure 6)

Defoliation varying from light to heavy has occurred on the northern half of this unit since 1968. The current trend is for defoliation to decrease in the northern portion and increase in the southern half. This was the pattern in 1976 according to aerial observations. Egg mass data and subsequent defoliation predictions for 1977 closely follow this pattern as evidenced in Figure 5.

Krassel Unit (Figure 7)

After eight consecutive years, budworm populations still persist along the South Fork of the Salmon River on the Krassel Unit. Area and intensity of defoliation declined in 1974. Since then populations have increased with the result that larger acreages have been defoliated to a higher degree of intensity. Aerial observations in 1976 revealed several thousand acres heavily defoliated. Top kill and understory mortality was readily observable in many drainages. Defoliation as determined by aerial surveys over most of the unit in 1976 was classed as heavy. Subsequent egg mass surveys indicate continued heavy defoliation for 1977.

Table 2. Predicted Defoliation for 1977 From Western Spruce Budworm.

National Forest	Defoliation Class	# Plot Samples	% of Total
Boise	Light	8	28
	Moderate	8	28
	Heavy	12	41
	Very Heavy	1	3
		29	100
Payette	Light	53	35
	Moderate	44	29
	Heavy	49	33
	Very Heavy	4	3
		150	100

DISCUSSION

Aerial sketch mapping in 1976 revealed defoliation by the western spruce budworm had expanded and intensified over much of the Payette and Boise National Forests. Acres defoliated were approximately 900,000 compared to 550,000 in 1975. Expansion of the defoliation was particularly noticeable in Price Valley and Brundage areas of

the Payette National Forest and in the Johnson Creek drainage of the Boise National Forest. Intensification of defoliation into the heavy category was observed along the South Fork of the Salmon, west of Brundage Mountain and south to and including the No Business Mountain area on the Payette National Forest. The West Mountain area of the Boise National Forest also showed heavy defoliation in 1976.

Data from the egg mass surveys indicate western spruce budworm will continue to cause moderate to heavy defoliation on over 500,000 acres of the Payette and Boise National Forests during 1977. Expected parasitism of near 10 percent in 1977 will not be a significant factor in budworm population reduction in 1977.

Results from the various surveys indicate defoliation by western spruce budworm will expand in acreage and intensity over the bulk of the area infested in 1976. Climatic factors could reduce budworm populations if prolonged severe winter freezes, sharp spring freezes or heavy rains during early larval movement occur.

Land managers, in the past two years, have voiced increasing concern about management of budworm affected stands. They feel the time is rapidly approaching where chemical control will have to be considered. To this end, we conducted an impact evaluation in 1976 to determine more precisely what real damage the budworm is causing. Impact information is being compiled in a separate evaluation which will be released early in 1977.

To date western spruce budworm activities in Douglas-fir and true fir stands has caused top kill and moderate losses to reproduction. In addition, cone-set and seed production has been virtually non-existent in many areas. These factors plus additional information from 1977 impact studies will be presented to land managers late in 1977. At that time the decision for or against a 1978 suppression project will be made.

RECOMMENDATIONS

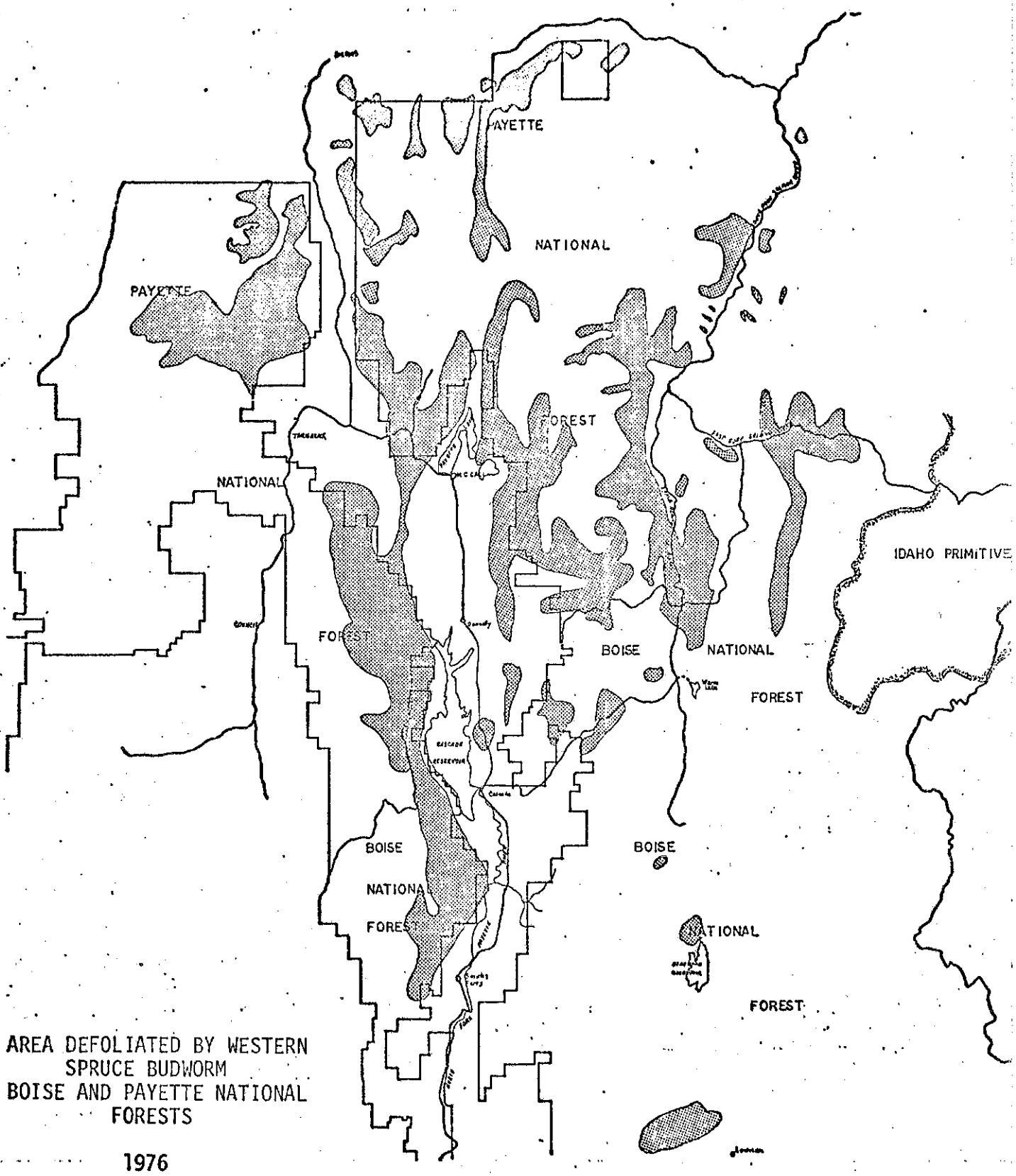
1. The Payette and Boise National Forests should complete section 3 of the EIS in anticipation of operational western spruce budworm spray projects in 1978-79.

2. Insect and Disease Control personnel, in cooperation with Forest Insect Research and MAG, will conduct a field experiment and pilot project using promising pesticides to obtain registration of these materials.

3. In budworm prone stands, land managers should give careful consideration to managing for non-susceptible host trees; shortening rotation wherever possible; breaking up large areas of susceptible host type and encouraging management toward younger, thriftier stands.

4. Insect and Disease Control personnel should conduct an aerial detection survey, parasite survey, egg mass survey and expanded stand impact survey in 1977 to provide land managers with pertinent information on western spruce budworm.

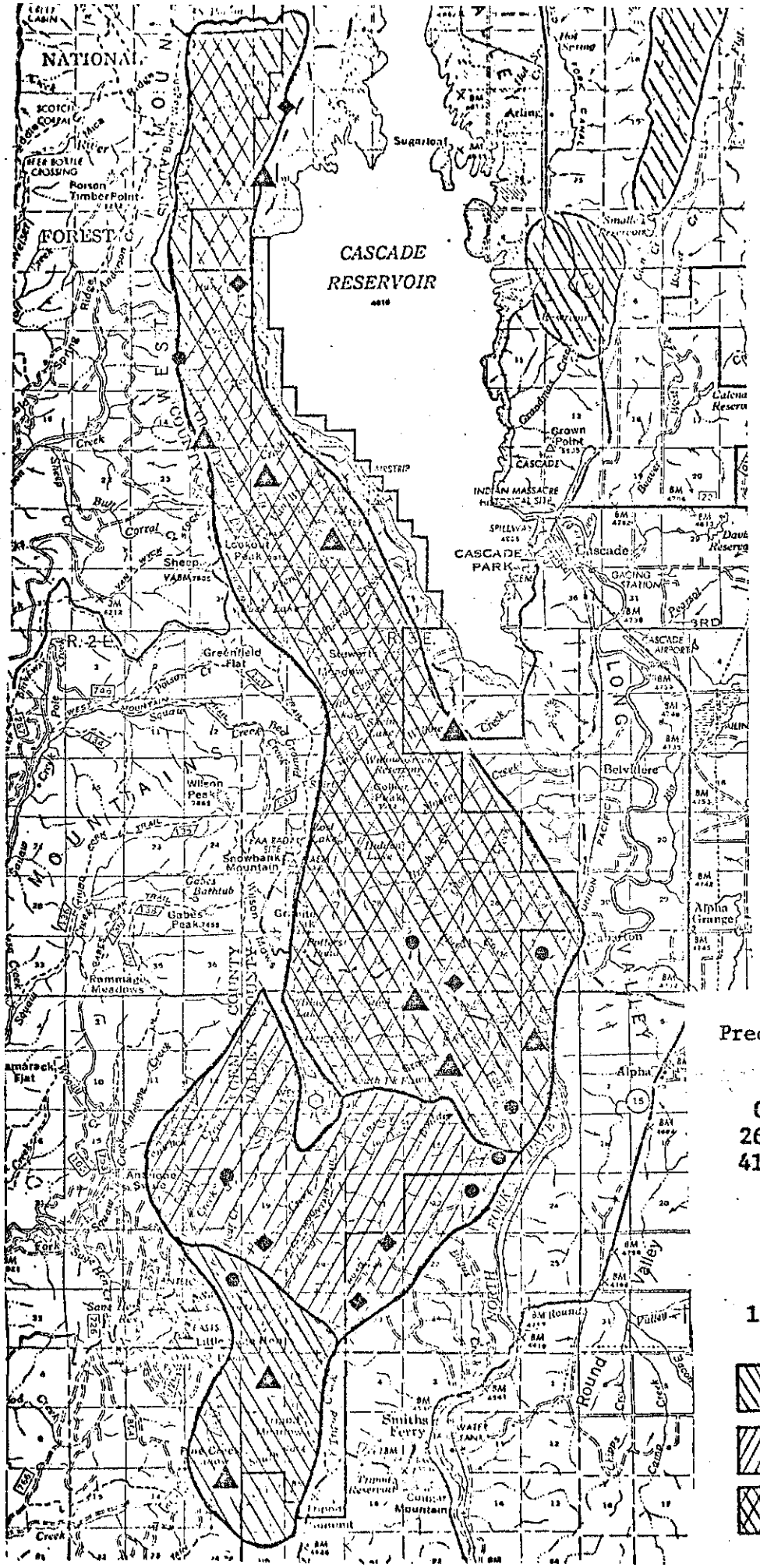
Figure 1



AREA DEFOLIATED BY WESTERN SPRUCE BUDWORM
BOISE AND PAYETTE NATIONAL FORESTS

1976

Figure 2



WESTERN SPRUCE BUDWORM

CASCADE UNIT

Predicted Defoliation for 1977

0-25	Light	●
26-40	Moderate	◆
41-55	Heavy	▲
>55	Very Heavy	⛢

1976 Defoliation

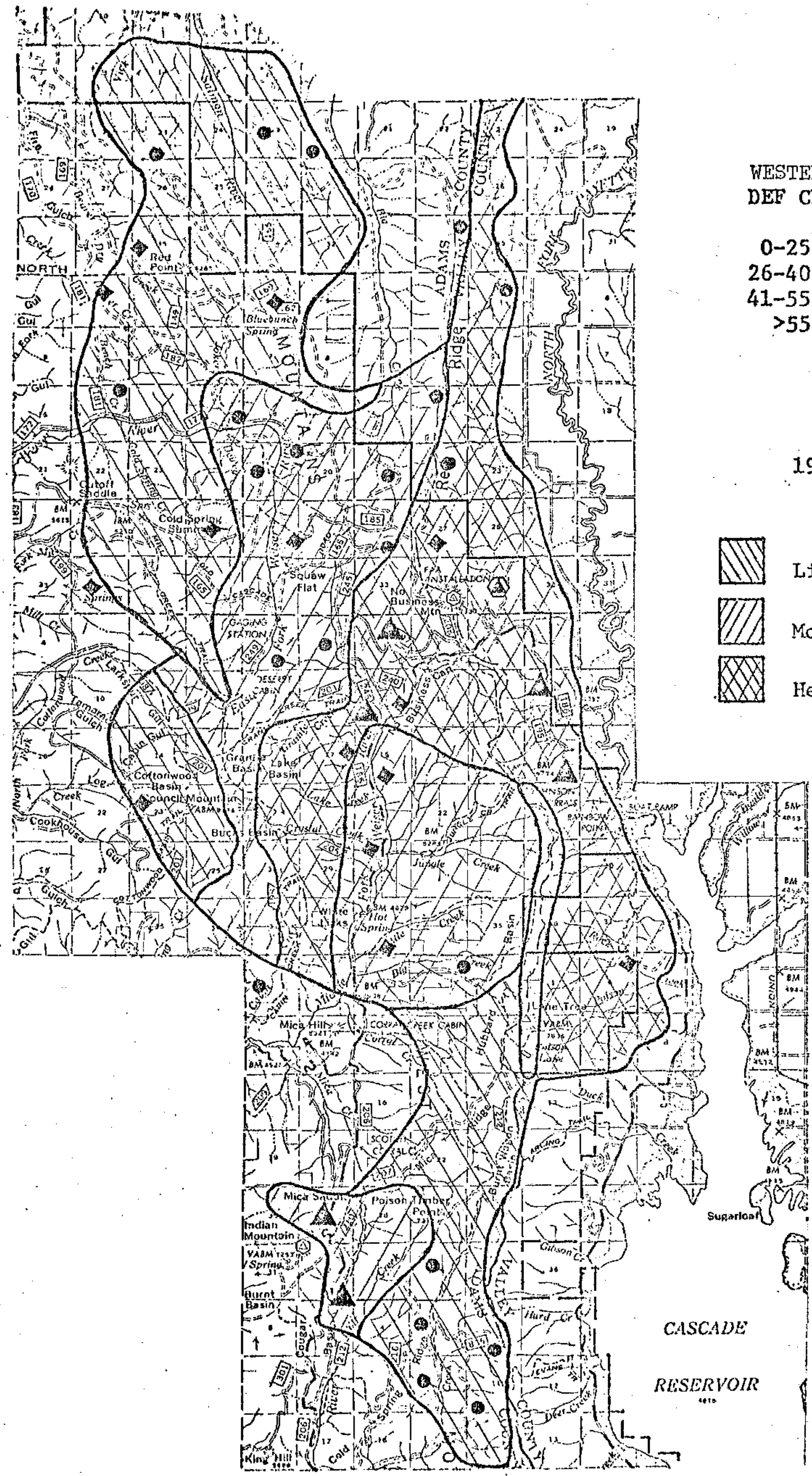
Light

Moderate

Heavy

Figure 3

COUNCIL UNIT



WESTERN SPRUCE BUDWORM
DEF CLASSES

0-25	Light	
26-40	Moderate	
41-55	Heavy	
>55	Very Heavy	

1976 Defoliation

Light

Moderate

Heavy

Figure 4

WESTERN SPRUCE BUDWORM

PRICE VALLEY UNIT

Predicted Defoliation
for 1977

0-25	Light	
26-40	Moderate	
41-55	Heavy	
>55	Very Heavy	

1976 Defoliation

- Light
- Moderate
- Heavy

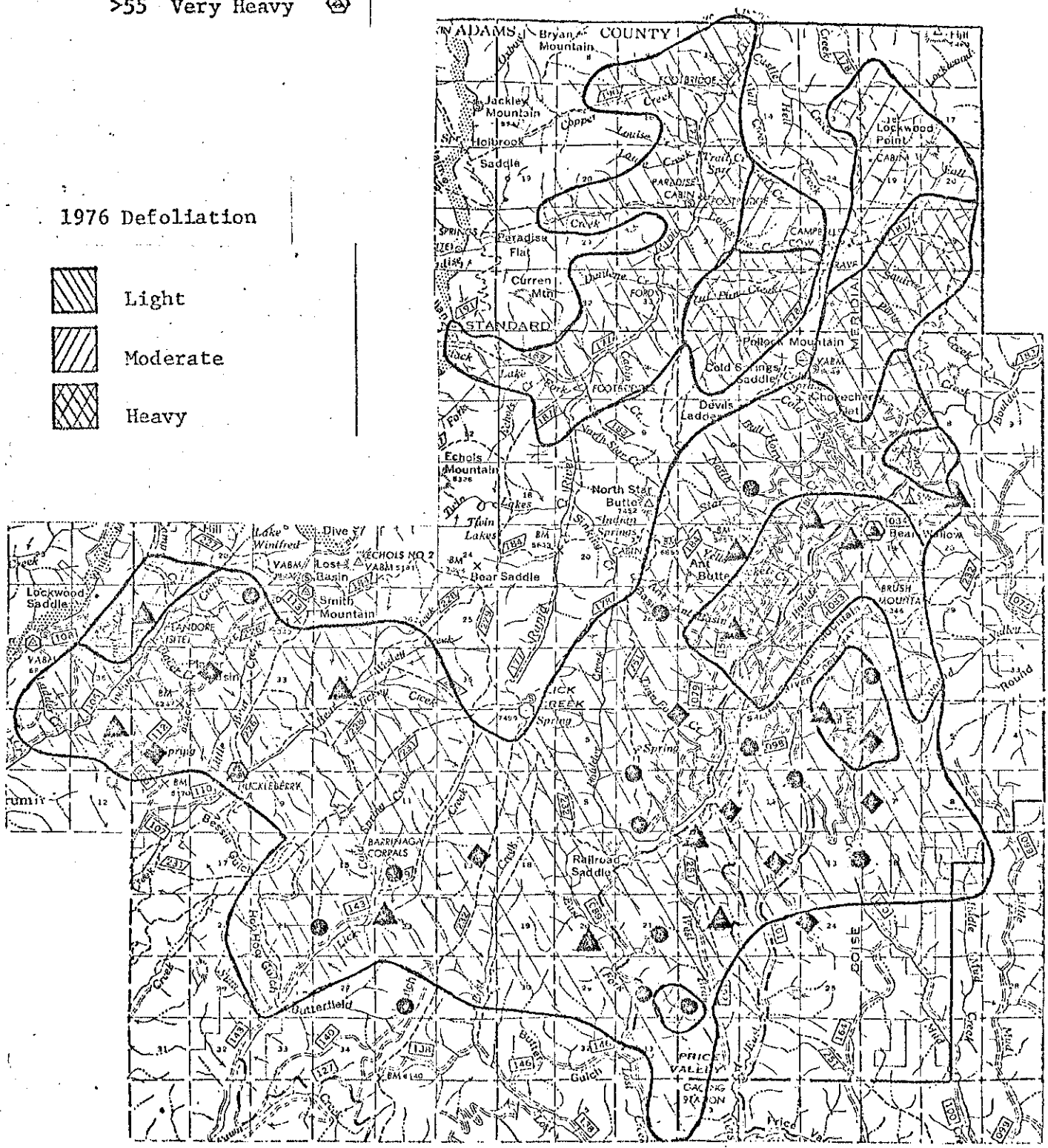


Figure 5
WEST McCALL UNIT

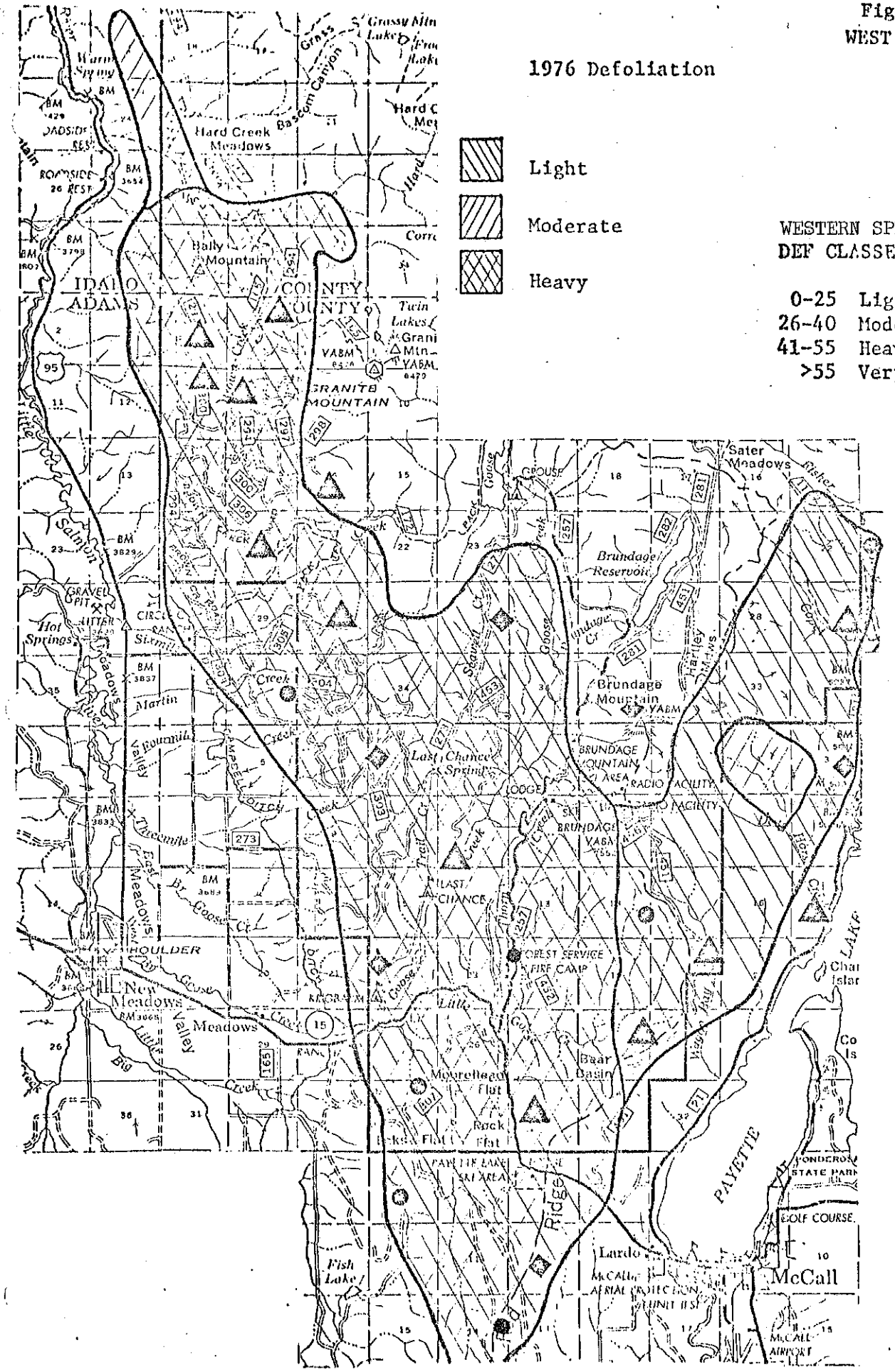
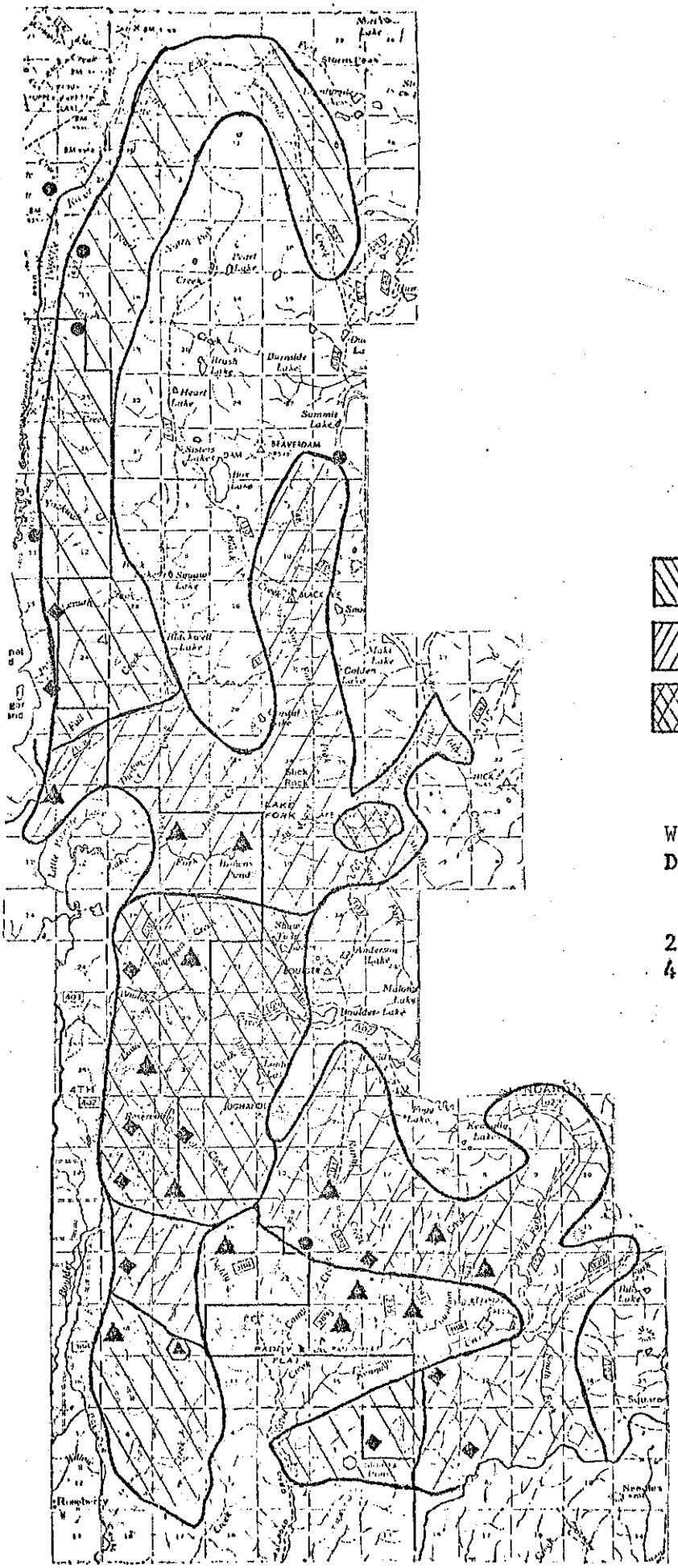


Figure 6

EAST McCALL UNIT



1976 Defoliation

Light

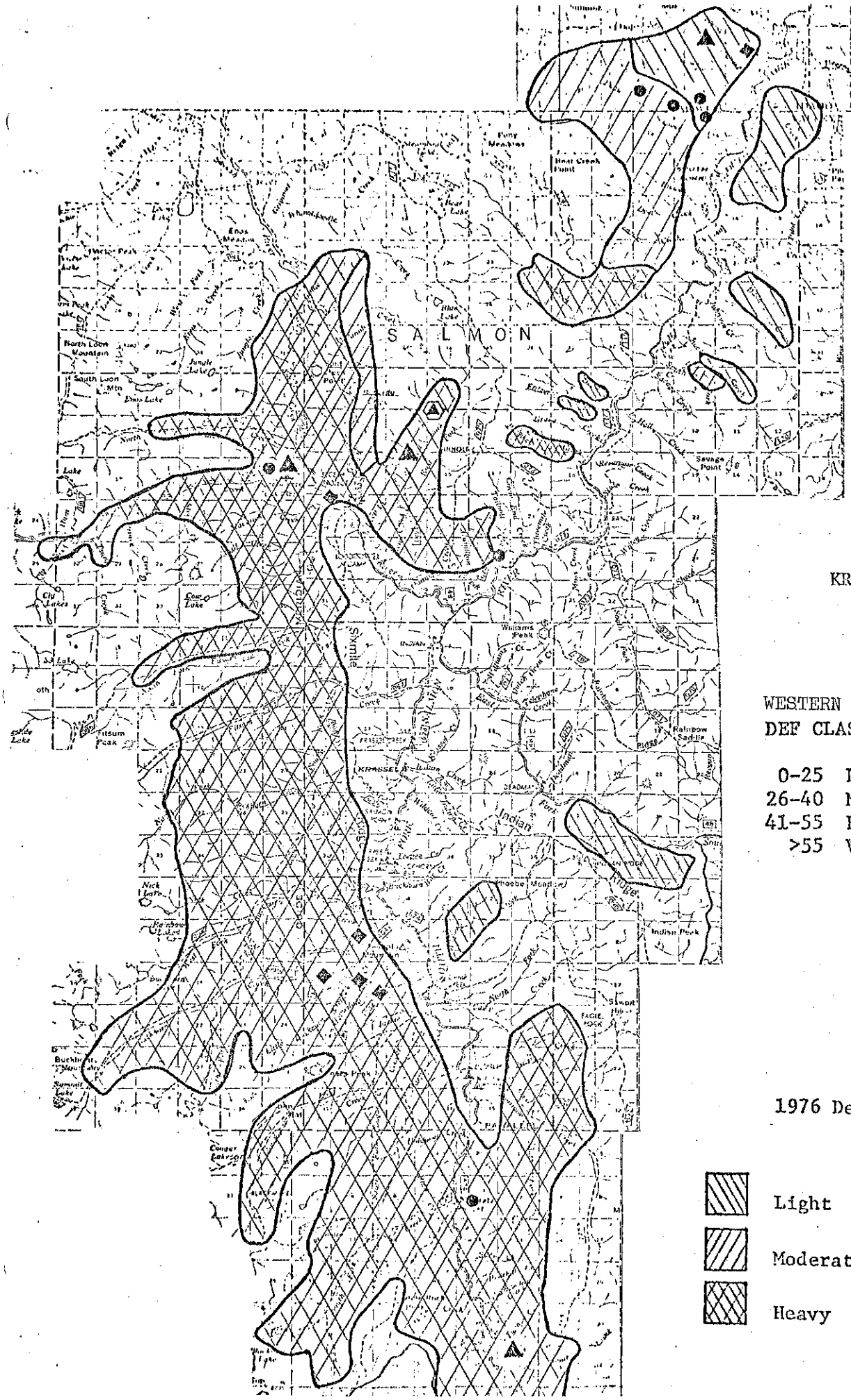
Moderate

Heavy

WESTERN SPRUCE BUDWORM
DEF CLASSES

0-25	Light	
26-40	Moderate	
41-55	Heavy	
>55	Very Heavy	

Figure 7


SALMON
KRASSEL UNIT
WESTERN SPRUCE BUDWORM
DEF CLASSES
0-25 Light
26-40 Moderate
41-55 Heavy
>55 Very Heavy
1976 Defoliation
Light
Moderate
Heavy